SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1826.—Vol. XL. LONDON, SATURDAY, AUGUST 20, 1870. {STAMPED .. SIXPENCE. UNSTAMPED.FIVEPENCE

OINT MEETINGS OF ENGINEERS AND SHIP-BUILDERS AT GLASGOW.

THE MAGNETIC IRONSTONE OF ROSEDALE ABBEY, CLEVELAND.

Mr. John Marley (Darlington) read the next paper:—

e the subject of Cleveland ironstone has an important bearing on ironmaking erally, in the same manner as the extent of the unexhausted Scotch black- d ironstone has on ironmaking in Scotland, it must be important to a meet- such as the present. The writer, therefore, thought this magnetic district itable subject to call your attention to, especially the extraordinary deposits agnetic ironstone in Rosedale Abbey, now locally known as Rosedale West. he whole of the Cleveland ironstone district has become too large for dealing h in any single paper, and as it is thought that to the profession, as well as he public, a full description of the result of the explorings of the last eleven rs, showing the actual extent and position of such ironstone, will be accept- e, as setting forth its present real bearings. Having had the opportunity ring the month of June last of visiting and examining this wonderful deposit ronstone, and previous to such visit having seen No. VIII. of Spon's "Dic- ary of Engineering," published in 1869, where the writer found, under the d of "Boring and Blasting" (page 50), there was given as an example of ng for minerals the paper of our first President, the late Mr. N. Wood, on Rosedale Ironstone, the writer felt induced to bring this subject before the ent meeting, thinking that this meeting afforded a good opportunity of ng correct details of this magnetic ironstone, and at the same time of doing ice to the late N. Wood and the late J. Bewick, both of whom took a pro- ent part in the discussion quoted in Spon's "Dictionary," the editor of ch, it is understood, will be glad of the opportunity of placing the real facts re the public as to the extent and peculiarities of this deposit.

the paper of 1857, of the "Tranactions of the North of England Institute ngineers," Rosedale was alluded to on account of its large percentage, im- se deposit, and magnetic properties of the stone; and although iron had been e there 600 years ago, it was not until modern times (1834), and again in 1853, it received attention. In 1857 the quarry was improved as to the extent or kness, the stone being in a conglomerate state, not stratified, lying neither ical nor horizontal, and allusion was made to the check or slip, running allel to drift, and to the want of an exploring drift driving behind the quarry rove the ironstone. When making an examination, in 1857, the writer had no doubt that Sheriff's drift seam, about 13 feet thick, was the top seam of Lias formation, now known as the seam of the district, and the same seam at accompanying the paper of 1857 (at the point *a*), as also probably the seam as found at or adjoining the quarry. These suppositions have since found to be correct, and that such top seam actually overlies the magnetic e of the quarry, forming the roof of the magnetic stone in drifting, the per- ge of iron and quality being, however, very different. Whether the writer correct in his view as to the magnetic stone being, or ever having been, part derived its percentage from the top seam is still an unsettled question; ough, on the other hand, it cannot now be called either a "vein" or a ." The stone, although attracted by the magnet, before calcining will only, some very rare exceptions, attract iron itself. The best parts contain 49 to er cent. of metallic iron, whereas the best part of the main seam of Cleveland stone at present in use can only be said to yield 32 per cent., down to as low per cent., the top seam of "Rosedale East" being said to be equal to about r cent. and upwards, although the same seam in the same valley is found eld in some places not more than 20 per cent. The writer went on to give e quotations from the late Mr. N. Wood and Mr. Bewick, after which he re- d to the plan No. 1 of the workings at Rosedale West, which showed the nt of each trough to be about five to six acres, or only about one-fifth of the rficial area originally expected, and that was by the borings alleged to be d, and the two troughs only about 150 yards in greatest width, instead o miles, as previously stated, the greatest depth being about 32 yards. The r continues that it will be seen from the quotations given that the late Wood, naturally inferring that the drifts and three borings had sufficiently d the extent of magnetic ore, never doubted their accuracy; but from in- ation since got it is seen that, had his original advice been adopted, when ards in, to have driven 100 yards north and south of cross-cuts, the extent d soon have been definitely proved, and future errors prevented. The drifts, ver, on getting to the distance of 400 yards, came on a shale check in front, being 300 yards distant from No. 2 boring, and such check had also been d on each side of the troughs, and on following this up it was found to be nd of the magnetic ore to the west, and simultaneously with such termina- was found a slip dyke to the west. Having proved this termination of mag- ore, and entering only on to the top seam of the district, a drift of about ards was, with all possible speed, continued up to No. 2 bore-hole, hoping on reaching such bore-hole the two magnetic beds would be got instead of ne lost; but the "baseless fabric" was now shown on putting a staple up ing such bore-hole within its area) to the position of the alleged 15 ft. of netic ironstone, but instead of which there was found only the ordinary non shale *in situ*, and on sinking such staple down to the position of the ed 32 ft. of magnetic then *in situ*, besides the regular top seam of the dis- containing from 20 per cent. to 26 per cent. of iron, the other part was d to be only sandstone and shale, as usually concomitant to the said top , which at the quarry there is usually about 11 ft. to 12 ft. in thickness. gleby Mines very extensive borings were made to find the magnetic deposit, without success. The regular dip of the strata is 1 in 23 to the south. The hs alluded to are nearly due east and west, and to this circumstance some rtance has been attached in endeavouring to elucidate the magnetic qua- and on this, as well as regards the formation of the troughs, some have ested icebergs and glacial action; but, however caused, it is clear they can nger be called either one or two beds of regular strata; and, as to being , not the slightest fissure of any kind has ever yet been found at the bottom e two troughs, although such has been most diligently sought for. Not- standing the smaller extent of area than originally expected, the present rs have, since they took possession, about July, 1864, landed about 500,000 of this magnetic iron ore from Rosedale West; besides, in the previous three a quarter years—from April, 1861—about 250,000 tons were sent away, and is still a considerable quantity to work, although from its situation and e only a small quantity can now be got.

he Chairman said: I have great pleasure in confirming the de- , outlines, and sections of the paper which Mr. Marley has just . I do this with the less diffidence from being employed as the nt for the mineral proprietor of Rosedale. One very important t is the very uncommon character of this deposit. There has been such another deposit found in the whole Cleveland district, this is a peculiarity which we have no means of solving. Mr. rley has referred to Mr. Bewick's book and Mr. Nicholas Wood's per, and has pointed out the absurdity of the idea of the volcanic gin of the deposit which Mr. Bewick propounded. I had an op- rtunity of certifying this from frequent observation of forest wood the layers or intervening spaces of sectional area of the magnetic ft. deposit. These fossils would not have been perceptible under action of the Plutonic influence. The fossilised trees were 2 or long, with full circumference still apparent. Mr. Marley remarked t up to the present explorations had been confined entirely to the tside of the valley of Rosedale, but I hope in the interests of the pro- etor that other deposits of a similar nature may yet be explored.

Mr. Isaac Lowthian Bell said that the gentlemen who had just ken were so much more competent to deal with the question than was that he hardly ventured to make any remarks. At the same e it struck him that on the first discovery of this red ironstone, ee gentlemen who took the sanguine views alluded to by Mr. rley had been somewhat led away, and that their statements were justified by circumstances, even at that time developed, of the case point. In the first place, the subject of the discovery was purely natter of geology. It was always apparent to him that seams of nstone which appeared so suddenly, and developed themselves to reat a thickness, would be found to have a corresponding weight. h regard to the character of the deposit, it seemed perfectly erro- us to speak of it as a non-stratified rock. Its thickness was so great that at first sight it appeared to be amorphous in its character, and non-stratified, but the circumstances to which allusion had been made proved that it was, undoubtedly, the contrary. With regard to its volcanic origin, nobody who had given himself the trouble to examine the constitution of this ironstone could have arrived at any such conclusion. The analysis he had seen gave the idea of carbonaceous matter, and that was inconsistent with the idea of volcanic rock. He did not mean to say that they might not expect to find a certain quantity of water. It was not, however, water mechanically combined, but water in a state of hydration. That was not a common circumstance; but there was also a quantity of carbonic acid—about 10 per cent.—and those two circumstances together forbade the idea that the mineral could have had a volcanic origin.

Mr. Marley briefly replied to Mr. Bell's remarks, and pointed out that the west end into the hill was mechanically lower; therefore the trough would have a depth to the west, that being the easternmost point, and the deposit would be considerably lower than at the opening of the hill side. This was the case only with the Garbutt deposit. The Kitchen deposit was quite the opposite way.

ON THE DUTY OF CORNISH AND OTHER PUMPING-ENGINES FOR DRAINING MINES.

Mr. J. B. Simpson commenced his paper on the above subject by setting forth that as he had recently had an opportunity of erecting a Cornish engine in the Newcastle district he was able to speak decidedly as to its merits and results. These being so satisfactory, and contrasting so favourably with the duty of the other engines usually employed in the Northumberland and Durham districts, it had been thought that to all those connected with mining some details of the duty of the Cornish engine, as compared with those generally in use, would possess considerable interest, and would, at such a meeting as the present, lead to an interesting discussion on the most economical and best adapted machinery for draining mines, a subject which is every day becoming of more importance, greater depths having to be drained, demanding, of course, greater economy. The Cornish engine is single-acting, condensing and expansive, with an over-head tram, the pumps being attached to it at the opposite end from the cylinder. The strain is applied on the top side of the piston, and is entirely cut off when about one-third to one-half of the stroke is completed. It then expands, and thus finishes the remainder of the stroke, assisted by the vacuum underneath the piston. The pressure of the strain at the end of the stroke is generally at or below the atmospheric pressure. The cylinder is always made of sufficient size, so that the work may be accomplished by an average pressure or strain, and a vacuum of not more than 17 or 18 lbs. per square inch. There are instances, of course, where this pressure is very much exceeded, but that interferes generally with the economical result. In the downstroke of the engine the pump-rods in the pit are lifted, and these are generally arranged to be slightly in excess of the weight on the column of water, and should they be greater the application of a balance-beam remedies the defect. Plunger sets are also employed where possible, except when pumping out of a shaft filled with water, or at the bottom of the pit. This latter set should be as short as possible, and certainly not more than 10 fms. In the upstroke of the engine the weight of the rod lifts the piston, the steam escaping from the top of the underside through the equilibrium-valve; and when the stroke is completed the exhaust-valve, always of large dimensions, allows the steam rapidly to escape to the condenser, when a vacuum is formed to assist the downstroke of the engine. The great differing features of the Cornish engine from other pumping-engines referred to are as follows:—

1.—That it is generally worked at a high rate of expansion.

2.—That there is a steam-jacket attached to the cylinders; that the cylinder is covered with felt; and in addition to this a covering of ashes or clay about 1 ft. thick, and then a covering of brickwork, to prevent radiation; and that there is a drain-pipe from the jacket to carry away the water from the condensed steam to the boilers.

3.—That the boilers and pipes are all arranged so that there is the least possible radiation of heat. The boilers being generally covered up with fine ashes or common clay, slow combustion is also aimed at.—After describing in detail the Cornish engine which has recently been erected at Hebburn, the writer proceeded to give some of the experiments made thereon, in order to ascertain its duty. The annual cost of 100-horse power of effective duty, according to the results obtained of (say) 3·6 lbs. per horse-power per hour would amount to 83*l*. Only one fireman is necessary each 12 hours, in addition to the engineman. The writer proceeded—Previous to this engine being erected, we visited some of the large Cornish engines at the mines in Cornwall, and found that about 3 lbs. of coal per horse-power per hour was about an average duty attained, under unfavourable circumstances. Probably, the most remarkable engine is the 100-in. engine at these same mines, but now removed, and an extract from the *Mining Journal* of Feb. 25, 1860, may be interesting:—"This engine made on an average 5¾ strokes per minute, and gave a duty of about 70 millions. The enormous work performed by it may be judged from the following particulars. Attached to it there are 14 lifts of pumps, of a total length of 381 fathoms. The quantity of water in these lifts raised by each stroke is 16,266 gallons, weighing 72 tons. The total weight of the mass put in motion at each stroke, including the rods and their counter-balance, amounts to the enormous total of 834 tons."

The importance of Cornish engines for water works seems to be generally acknowledged. At the East London Water Works alone they have no fewer than seven large Cornish engines, with cylinders varying from 72 in. to 100 in. in diameter. Much discussion has taken place in the engineering world on the merits of the Cornish engine as compared with the compound high and low pressure and rotative engines for water works. The latter kind, as erected at the Lambeth and Chelsea Water Works, is said to have attained the very high duty of 111,350,000 lbs., or equal to 1·99 lbs. per horse-power per hour of effective, or 1·61 lbs. of indicated duty. We have not yet heard of its application to mines. The uniform motion which it would give to shear-rods in the pit would, as compared with the rapid upstroke of the Cornish engine, be in its favour.—After describing the principle of the double beam-engine, the Watt engine, the single beam-engine, and the horizontal rotative pumping-engine, Barclay's patent overhanging beam-engine, the direct-acting engine, and the rotative beam-engine, Mr Simpson went on to say—In ascertaining the duty of the foregoing engines we have calculated the quantity of water delivered each stroke, both in the bucket and the plunger. We have not been able to make any experiments as to the exact quantities delivered by buckets-lifts, but we have made trials with three sizes of plungers, as follows:—

Diameter of plunge. Inches.	Stroke.	Calculated quantity per stroke—Gallons.	Measured quantity.	Difference.
18¼	80 in.	75·4	73·5	1·9
20	88 in.	99·7	96·5	3·2
25	99 in.	176·0	172·0	4·0
		351·1	342·0	9·1

These results show an average loss of 2·52 per cent. There is a great variation in the duty of the engines under consideration, and whilst allowance must be made in some cases for old machinery and defective arrangements, yet there is still a great balance in favour of the Cornish engine. It is quite possible that some engines of the types described might show similar results if worked expansively, and fitted up with a steam-jacket, and with valves of proper dimensions, and supplied with steam from proper boilers, and with properly-balanced pumping arrangements, and with many little details attended to which are often overlooked; but it remains to be seen whether such engines under these conditions would be as cheap as the Cornish engine. With respect to the coal used in these experiments, although we have not made any special experiments to ascertain the evaporative power in all the cases, yet they have all been conducted with small coal passed through ¼-in. screen, of the same estimated evaporative quality. When space is not so much an object, it is our opinion that if freedom from smoke and economy of fuel are to be obtained the ordinary Cornish boiler will produce these results quite as cheaply and as effectively as any form yet introduced, but with these conditions—that it be slowly driven, and that perfect combustion be arrived at. Many people believe that the harder you fire a boiler so much the better; at all events, this is too often the practice, and it is, to a great extent, the cause of such bad duty in our engines. There is great economy in having abundance of boiler power. We recently made an experiment with two Cornish boilers, and found that during 24 hours an evaporative power of 7·7 horses was realised, and that with two egg-ended cylindrical boilers, placed alongside and going into the same chimney, an evaporative power of 6·7 horses was obtained, thus showing a saving in favour of the former of 13 per cent. Taking the engines we have mentioned into consideration, we find a total aggregate effective power of 1030-horse power applied, realising on the average a duty of 14 lbs. per horse-power per hour. This we believe to be the average duty of the district. Where a duty of 4 lbs. was obtained the saving on these engines alone would represent 40,000 tons of coal per annum, which, at 3*s.* per ton, would equal 6000*l*. We may safely assume the total horse-power of engines used for pumping water in the Newcastle district at about 10,000, and upon the above basis of saving we have a very momentous sum as the result. In many places coal may not be worth so much as 3*s.* per ton at the pit's mouth, but in the majority of cases it will very much exceed this. We are too much inclined to think that coal at the colliery is of little or no value, and that the extra consumption of 10 or 12 lbs. per horse-power per hour is not worth consideration. It must not, however, be forgotten that the fuel is not the only pecuniary point of the question, for additional consumption of coal means additional boilers, additional repairs, and additional wear and tear, to say nothing of additional manual labour; and these, in the aggregate, are very serious items of cost. There is no doubt that more attention is being paid to this subject than formerly, and we venture to predict that the time is not far distant when pumping and all other colliery engines will be erected with more regard to annual economy, and that the effective duty of 2 or 3 lbs. per horse-power per hour will be considered quite as important in them as it is now in the London water works and in ocean steam-ships.

Mr. Stevenson (Airdrie) was inclined to think that the Cornishmen gave too much credit to the Cornish engine, without making allowance for the fact of covering the engine, and so on. There was no special value in the Cornish engine any more than in several other kinds of engine he could mention. It was quite possible that in conducting their experiments they had overlooked that steam was applied; they assumed that the water was a certain amount; they took such and such a temperature, and so many feet of pressure; and then they assume that the engine was doing so much work, when it was doing nothing of the kind.

Mr. Simpson said he had another diagram to show the cost per indicated horse-power per hour per ton, and the effective duty. The engine which Mr. Stevenson referred to was 44, or it was realising 84 per cent. of effective duty; but still, taking that into consideration, 977*l*. was the cost per annum of coal for 100-horse power of effective duty, and indicated duty brought it down to 842*l*. The effective duty of the Cornish engine, according to the experiments which he had made, was 81 per cent., and gave an indicated duty of 230 lbs. as compared with other engines, which gave 79, 81, 83, and even as far as 89 per cent. He took, in all cases, the calculated quantity. Mr. Stevenson complained he had taken the Cornish engine. He had frequently studied the question, and he gave them the results of the different engines. He had given the quantity of water pumped by the plungers, at a cost of only 2·5 per cent., and he believed that Mr. Stevenson, in a former paper, had stated the loss by buckets at something like 10 or 20 per cent., so that as far as the plungers were concerned he thought there was no better form of pumping water. There was no better way of getting a quantity of water for each stroke.

Mr. Stevenson (Airdrie) said that in the arrangement of the Cornish boiler there is nothing peculiar. Its alleged superiority was owing to the extreme care taken in firing. He thought no proper engine could give proper maximum results of economy unless they got a greater speed in the piston than could be obtained either in the Cornish engine, or by any pumping-engine with direct action through the pumps. He thought the slow speed of the Cornish engine would conduce unfavourably to such results. The slow speed necessitated a larger cylinder and a much larger working power, and, consequently, a greater amount of friction. Then there was the reversing of the back bands, which was also objectionable. His idea was that the best kind of engine was one with an up and down stroke, not one doing work with one half stroke, and then presently undoing it with the other half. The horizontal engine was the best if they could get greater speed in the piston, and that had recently been obtained by making one end of the bell-crank double that of the other.

Mr. Harvey (Cobham) said he had not yet given up the idea of being able to obtain the essence of coal for propelling vessels at sea, which could be stored in very small bulk, and thus save a great deal of stowage room.

Mr. W. Boyd remarked that the advantage of the Cornish engine over the old system lay in the increased pressure of steam employed, and the increased degree of expansion that could thereby be obtained. Mr. Simpson spoke of expanding the steam so as to consume 2 lbs. of coal per hour. He also spoke of Barclay's compound engine having a consumption of 1·6 lb. per indicating horse-power.

Mr. Simpson: A water works engine.

Mr. W. Boyd remarked that the increase of economy in the Cornish engine was due entirely to the higher pressure of steam employed in the boilers by having a cylinder in the proportion of 2 to 1, and cutting off by half a stroke the small cylinders, they got immediately a degree of expansion of 8 to 1, and therein lay the secret of the economy in the working of all pumping and other engines. He would not go into the general question, which was well known to engineers. The quantity of heat put into the steam at the higher pressure, was less in proportion, in order to get an equivalent degree of pressure than at the lower. Therefore, if they could expand it into a condensing engine as in the compound engine, that appeared to him to be the most economical way that could be adopted.

Mr. Jeremiah Head said he felt tempted to ask for two or three minutes, in order that he might call attention to the absolute necessity of bearing constantly in mind the distinction between the boiler which generated the steam and the engine which applied it. It was quite possible to have a very good boiler working in conjunction with a very bad engine, or *vice versa*. The absurd want of economy which his friend Mr. Simpson had shown to exist among the pumping engines at the North of England coal pits was not so much due to any particular form of boiler or engine as to the lack of maintenance in a reasonable state of efficiency. An engine of almost any kind, with little or no expansion, and supplied by an ordinary plain cylindrical boiler, would, if in good order, easily work with 4 to 5 lbs. of coal per indicated horse power per hour. Any excess above that was owing to leaky pistons or slides, exposed cylinder or boiler surface, excess of clearance in the cylinder, or exhausting into the atmosphere with a low initial pressure of steam. Such defects as these were very discreditable to steam users. But we must be careful before blaming any person for not at once choosing an engine and boiler on the Cornish principle, in preference to those in common use at collieries. It must not be forgotten that the advantages of high expansion can only be obtained by employing a larger and more expensive engine to do the same work. The same remark applied to the Cornish boiler. Putting aside the question of fittings and brickwork, a 50-horse boiler—that is, one capable of evaporating 50 cubic feet per hour—on the

plain cylindrical type, could be bought for 100*l*. A Cornish boiler of equal power, and of good quality, would cost nearly three times that amount. He had tried many experiments upon the relative economy of the two classes, and he found that the economy of the more expensive boiler only amounted to an average of 10 per cent. Was it to be wondered, then, that coalowners hesitated before expending a three-fold amount in order to obtain a saving of slack coal at the pit's mouth equal to 10 per cent.?

Mr. SIMPSON remarked that if as much attention were paid to other engines as to the Cornish they would be as economically worked as it was.

This terminated the proceedings of the first day, and after passing a vote of thanks to Mr. Simpson for his interesting paper, the meeting adjourned.

[*To be continued in next week's Mining Journal.*]

Original Correspondence.

COAL MINING IN THE COUNTY OF DURHAM.

HARTON COLLIERY, AND BOLDON NEW WINNING.

The extensive royalties held under lease by the Harton Coal Company (Messrs. W. F. Blackett and Partners) comprise the coal seams in the townships of Harton and Whitburn, Cleadon, East and West Boldon. The royalties are leased principally from the Ecclesiastical Commissioners, and from the Dean and Chapter of Durham, and adjoin those of Wearmouth, Usworth, and Wardley, being bounded on the east by the German Ocean. The Boldon pits are situated 1¼ mile west of the Harton pit, and four miles north from the Wearmouth pits. The Boldon pits are situated one mile outside the escarpment of the magnesian limestone formation; this escarpment, commencing near South Shields, runs in a south-west direction, by Cleadon, West Boldon, Pensher Hill, &c. The Wearmouth, Ryhope, and many other pits southwards were sunk through the magnesian limestone, to reach the coal measures lying underneath. Two pits have been sunk at Boldon, 40 yards apart; No. 1, to the west, is the upcast, 12 feet in diameter, commenced Feb. 19, 1866. No. 2 pit, to the east, is the downcast, 13 feet in diameter, commenced March 19, 1866. The Maudlin or Bensham seam was got in each in June, 1869.

The principal seams of coal sunk through at Boldon and their depth are as under:—

						Fms.	ft.	in.
Alluvial clay, to the coal measures						13	1	6
Coal, of inferior quality					2 ft. 3 in. at 149	0	0	
High main seam	Coal	1 ft. 6 in.						
	Shale	0 2						
	Coarse coal and shale	1 4 =	3	0	at 185	0	0	
Coal			2	7	at 204	1	9	
Yard seam	Coal	1 ft. 4 in.						
	Shale	0 4						
	Coal	1 4 =	3	0	at 220	5	9	
Maudlin, or Bensham seam			5	6	at 231	0	0	
Low main seam	Coal and splint		2	7½	at 244	0	0	
Hutton seam	Good coal	4 ft. 0 in.						
	Inferior coal	0 7 =	4	7	at 254	1	0	
Depth of sump					at	7	1	10
Total						261	2	10

In sinking several feeders of water were encountered, none of them of great amount; these are nearly all now excluded by cast-iron tubbing, the tubbing increasing in thickness with the depth.

In each pit there is built—	Fms.	ft.	in.			
—Stone walling	6	0	0			
—Cast-iron tubbing	125	0	2	Fms.	ft.	in.
—Fire-brick walling	130	2	8 = 261	2	10	

The tubbing in the No. 1 or upcast pit has a casing of fire-brick inserted before it. Two fine seams of coal have been already sunk through—the Maudlin and the Hutton seams, the former of which is now being worked. The company have inaugurated their success by erecting plant of the most approved principle; the pulley framing, screens, roofing, and platform being constructed wholly of wrought iron, the supports for the latter of cast-iron; the whole structure is of great strength. And also a permanent winding-engine at No. 2 pit, constructed by the firm of Black, Hawthorn, and Co., with some novelty in its details. This engine has two 40-in. horizontal cylinders, 7-ft. stroke, direct acting, it is non-condensing; 40 lbs. steam pressure, fitted with 9-in. double-beat valves, spiral drum, foot and steam breaks, and engine for reversing the eccentrics and valves. The spiral drum is 14½ ft. in diameter at the first lap, increasing 6 in. in radius at each turn; after fifteen turns the diameter has increased to 26 ft., when the drum becomes flat; there are eight more laps on this part, which is 15 in. broad on each side. A space of 12 in. between these, in the middle of the drum, is the circle on which the break strap acts, the strap going nearly half around a circumference of 84 ft. The breadth of the drum altogether is 11½ ft., the grooves are 3 in. deep, the outer edge of each side is protected by a rim, rising 12 in. from the drum. The wire-ropes are of steel, 5½ in. in circumference. The steam-break cylinder is 12 in. in diameter, open at top; the power is increased by a lever in the proportion of 6 to 1. The reversing gear is worked by means of two 12-in. cylinders, with trunks 7 in. in diameter, stroke 12 in. A dial indicator, making one revolution, while the engine goes 19½, is moved by means of ten bevel wheels. There is another indicator, working with the ordinary chain and a bell.

There are five boilers, plain cylindrical, 45 by 6 ft., each fitted with two safety-valves, two floats, one sludger, and one unplugging valve. The boilers are suspended from three girders erected over them, and each boiler has Jucke's fire-grate applied to it. The chimney is 100 ft. in height.

The length of each steel wire-rope is 310 fms.; its weight 73 cwts.; the weight of rope from the pulley to the bottom of the pit is 57 cwts. The cages are constructed of steel, each cage carries four tubs in two decks; weight of cage, 32 cwts.; of four iron tubs, 31 cwts.; and the coal carried in them, 4 by 12 cwts.=48 cwts. The pulley-frame consists of four legs and two backstays. The legs are 73 ft. in height from the surface to the centre of the pullies; each leg is 15 in. square at bottom, 12 in. at top, formed of angle iron, united by lattice work. The backstays, similarly formed, are 12 in. square; the pullies are 15 ft. in diameter. There will be 12 screens erected; four at present are put up; these are 25 ft. in length, ½-in. spaces, close for 2 ft. in length at the bottom. The height from the rails to the platform is 25 ft.

An engine placed between the pits was at the commencement used for sinking each pit in turns; it has two 18-in. horizontal cylinders, 3-ft. stroke, on second motion, and has always worked with one flat rope. It was used afterwards solely for sinking No. 1 pit. The engine for sinking at No. 2 pit at the same period is one which was erected originally as a pumping-engine. It has one 47-in. vertical cylinder, 6-ft. stroke, high pressure, but has condensing apparatus connected to it; wrought-iron levers, from one of these a connecting-rod is attached, which works a cast-iron beam, extending to No. 2 pit. At the inner end of this beam a staple 35 fms. in depth is sunk, in which the high lift of pumps was fixed, which were 18 in. in diameter. The low lift in the pit was suspended from crabs and four-fold blocks, and were 15 in. in diameter, and were used through the feeders to the depth of 80 fathoms. The pumps are now all removed. The drums of this engine and the levers rest altogether on wood framing.

A beam engine, also placed between the pits, has a 31-in. cylinder, 6-ft. stroke, on second motion, works with one flat rope; it is now used to raise water in barrels from a lodge-room, 150 fms. down, at No. 1 pit. These three engines, being all placed for sinking purposes, will eventually be removed.

The Maudlin seam is in process of opening out in No. 2 pit; a pair of headways have been driven 400 yards, in a direction south 11° west from the pit; another pair are going south 60° west. The seam lies nearly level north and south, and it has a slight rise eastward, about ½ in. per yard. The principal cleavage runs about north and south.

SECTION OF THE MAUDLIN SEAM, FACE OF HEADWAYS.

	Ft.	in.
1.—Grey metal, good roof		
2.—Top coal	3	0
3.—Splint	0	2½
4.—Coarse coal	0	1½
5.—Bottom coal, good	2	5 = 5 ft. 9 in.
6.—Thill, post and fire-clay.		

Six places are being driven in the Maudlin seam; open lights are used. The coal does not give out much gas. A temporary furnace is being erected for the ventilation of the mine. The Hutton seam is not yet worked, further than sinking through it in the pits. It will probably be worked and raised at No. 1 pit.

HARTON COLLIERY.—One pit, 14 ft. in diameter, is sunk to the Maudlin seam; its depth is 210 fms. The pit is protected by stone walling at the top 15 fms., cast-iron tubbing 65 fms. following under that. This pit is a downcast, the upcast being the Hilda pit, 10½ ft. in diameter, and 1⅞ mile north-east from Harton. They are both used for raising coal, and belong to the same proprietors. The Harton winning was commenced in 1841, by Messrs. Brandling, and came some years afterwards into the possession of the present firm. They are used for raising coal, and belong to the same proprietors. The winding-engine at Harton, erected in 1863, is from the works of T. Murray and Co., Chester-le-street. (The engine originally fixed here is that 47 in. now at Boldon.) This engine has one 65-inch vertical cylinder, 7-ft. stroke, condensing, wrought-iron levers, flat wire-rope drums, 24 ft. 9 in. in diameter, increased to 28 ft., with 16 revolutions or strokes of the engine. The ropes are six stranded, and 6 by ⅞ in. in section. A foot-break is used; the strap acts half around the wheel. There are two counterbalance drums on the main shaft, 5 ft. in diameter, on which rivetted chains wind, a weight of 4 tons is attached to each chain. The house is built of ashlar stone, one side wall is 4 ft. 3 in., the middle wall is 3 ft. 3 in. in thickness; an opening in the latter is supported by wood beams, and a cast-iron column. There are six Cornish boilers connected to this engine, 30 ft. by 6½ ft.; 18 lbs. pressure is maintained in the boilers. Steel cages are used, each cage carries six tubs in three decks, each tub carries 8½ cwts. of coal. An average of 900 tons of coal is raised daily. Time in drawing each cage 1 minute, in changing six tubs, 30 seconds = 1½ minute each lift; at this rate 102 tons will be raised in each hour.

The pumping-engine has an 82-in. cylinder, 8 ft. 9 in. stroke, cast-iron beam, and condensing apparatus. The stroke in the pit is 7 ft. 9 in. This engine was made at the works of Messrs. Hawks, Crawshay, and Co., Gateshead, in 1841. In connection with it there are four lifts of pumps; the lowest, a bucket-lift, is 12 inches in diameter, 54 fms. in length; the other three are forcing-lifts, 15 in. in diameter, each 54 fms. in length; the total depth of the lifts from the bottom of the pit to the surface is 215 fathoms. The engine goes day and night, at the rate of 4½ strokes per minute. There are four plain cylindrical boilers, 30 ft. by 8 ft., 15 lbs. steam pressure; this pressure is applied on the top of the piston only; a slight pressure is required under the piston. A small engine is erected as a crab-engine, and another for raising or lowering men, in place of a gin and horse.

The underground workings at Harton are in the Maudlin seam only; the Hutton seam is as yet unworked. The Maudlin seam is similar in section to that given at Boldon. The water-level line is near north and south; the rise of the measures is eastward 3 in. per yard. Three self-acting inclines are in operation from the east, and seven from the south-east workings, these being supplied by various horse-roads branching from them. The coal is worked entirely on the bord and pillar system; the pillars are made 50 yards by 20 yards, the bords 5 yards, and the walls or cross-holings 3 yards in width. The bords are driven southward or northward, as the case may be, on the level course, and in panels, each panel averages 10 bords in breadth and 12 pillars in length; when a panel of bords has been driven the required distance the pillars are then commenced, and worked off outwards. Candles are used in the first process, and safety-lamps, so called, in the second process of pillar working. The ventilation for the mine is created by furnaces at the Hilda pit; about 100,000 cubic feet of air per minute circulates through the workings of Harton pit. The production of gas in the Maudlin seam is not great; the mine has been kept clear of explosions by the exercise of carefulness, and by supplementing this on a good and systematic method of ventilation.

The Harton coal is sold principally for household purposes, for which it is much esteemed. It is shipped on the River Tyne principally, and partly in the Tyne Dock, the latter being about three parts of a mile distant from the colliery.

NOTES ON CONTINENTAL MINING—No. VIII.

MINING IN THE HARTZ MOUNTAINS.

Leaving Clausthal by the Oker Valley, we find at the northern face of the Hartz group the famous mountain Rammelsberg. Throughout this district the veins lie at a considerable angle, 80° at Clausthal, with a dip to the south, and running east and west. They correspond to Werner's 4th system of lodes. But in this remarkable hill the whole substance of the rock seems permeated by ore, somewhat after the tin-floors of the Cornish mines. The orey ground is in the form of a wedge, nearly vertical, whose thin edge crops out at the surface of the hill, while the other end lies deep buried in the mountain. The surrounding rocks are grauwacke, and the ores worked are the sulphides of copper, iron, lead, and zinc, the carbonates of copper, baryta, grey copper ore, arsenical pyrites, and a small quantity of gold and silver. This mine is one of the most ancient in the district, and has no less than 15 shafts; though only two are at present used for winding purposes. The other shafts, with the immense cavernous excavations of former years, play an important *rôle* in the way of ventilating the present working levels. As these ores do not lie in either veins or beds, it is clear that special methods of working are required. The mine is quarried away, almost irrespective of direction, wherever the ore seems richest. This mode of procedure results in a series of vaults or caverns, bearing a remote analogy to the old pillar and stall operations of coal winning. The peculiar manner and conditions under which the ores have been aggregated in this hill have resulted in an extreme hardness of the mass, insomuch as to be almost impenetrable by steel tools. A story is told with all gravity at the mine, and, with the characteristic sensationalism of their books, has been incorporated into several French treatises—of a miner drilling a blast-hole in this Rammelsberg ore, under direct supervision, for 88 hours, during which he spoiled 126 punches, and had an untold number sharpened, used 6½ lbs. of oil for light, and had succeeded in drilling a hole of the ordinary size of 2 in. diameter to the depth of 4 inches. This experiment was undertaken with a view to test the actual expense of blasting, and clearly demonstrated its impracticability. The *modus operandi* of the Rammelsberg excavation has brought this mine into great notoriety. Fire is applied to the orey mass, and by means of the unequal expansion of the metallic substances and rock it becomes jointy, and more or less friable, so as to yield readily to the action of the crowbar. When a hollow has been cleared of the loose ore from a former operation a pile of faggots is arranged in an oblong form, so that when kindled the flame may impinge on the side or roof as it is required. When the roof is the object of attack, a raised platform of stones is erected, on which the pile of wood, called by the miners the chest, is arranged, to bring the heat to the desired point. Several of these chests are prepared in different parts of the mine during the week in readiness to be lighted, which is generally done on Saturday. The man appointed to that duty lights the faggots, and goes from one to another throughout the workings, until the chests are all fairly ignited. The mine is then closed until Monday; the old workings supplying plenty of air to maintain combustion. On Monday the mine is entered, but the strong odour of sulphur and the carbonic acid render it scarcely fit for the workmen. Accordingly, Monday is devoted to clearing away the remnants of the fires, and on Tuesday morning the miners begin in good earnest to get down with pick and crowbar the ores loosened by the heat. The effects of the fire do not often extend more than 1½ or 2 ft. in, unless where a previous fissure existed, thereby extending the action of the fire. Here the men work five days of eight hours each, and on Saturday four hours only.

The deepest mine in these hills is the Samson, and one full of interest, both from the richness and variety of its ores and from its showing the best example of understoping, there being at least 80. The present depth is 4500 ft. This is the richest mine in the Hartz Mountains, and produces arseniate and antimoniate of silver and native silver, besides blende and galena. These ores are smelted in the immediate neighbourhood, at Andreasburg.

The present annual profit derived from working the Hartz mines is 450,000*l*. But it seems open to question whether any considerable portion of this ever passes beyond the hands of the managing officials. Gold was worked 70 years ago to the value of 432*l*. annually; silver 120,420*l*., while the value of the total output for other metals was 175,909*l*., and the entire profit 63,791*l*.

From the sulphur of the Hartz ores there is an extensive manufacture of sulphuric acid, and particularly at Nordhausen, where the fuming acid is made, of S. G., 1·9, known throughout the scientific world. The ores at Rammelsberg are so rich in sulphur that for the last 200 years it has been the custom to calcine them to expel the sulphur previous to being dressed. The operation is conducted as follows:—A large square heap is formed on the ground by placing alternate layers of wood and ore in such a fashion that when completed the pile has the form of the frustum of a pyramid. The wood is then ignited, and after three days, it is said, so much sulphur is disengaged as to keep up combustion without the addition of fresh fuel. In about a fortnight the workmen make a few holes on the flat top of the pile, in which the sulphur collects. It is removed as often as the hollows are full, and thrown into water, to be afterwards purified and sold as the brimstone of commerce.

To the dressing of lead ores the Germans have devoted much attention. Most of the Hanoverian dressing works are on the same plan. We visited several, and, as a fair specimen of the rest, we will describe one, the Royal Clausthal Lead Works. The ore as it comes from the mine has an average of 3 per cent. With respect to this, several contradictory statements were given to us by the overseers, who seemed to arrive at the gross value of the vein-stuff by different means, but the above seems to us to be a tolerable approximation. After the best portions have been removed by hand-picking the rest is rough-crushed by rollers, and immediately underneath by two other pairs, closer and smoother. The mill has the usual wheel and bucket arrangement for bringing up the pieces too large to go through the sizer to be put through the rolls again. The small pieces from the rolls pass next to the stamps, arranged as usual, in sets. At these works 80 stamps are kept in operation; they are fixed at a lower level than the rolls, to allow the produce of the crusher to pass without labour to the stamping-mills. This arrangement in tiers applies to all the works we saw. From the stamps the pulverised ore is taken to the setz machines; eight are at work, and the same number of buddles. The sieve ore looked remarkably clean, but we did not think so well of the quality of the smiddim. Here, as elsewhere, the baryta is a troublesome enemy, and necessitates patient budding. The buddles upon which the slimes from the stamping and jigging processes flow are arranged in pairs, the highest part of one being below the rim of the other. In no part of dressing machinery does there appear to have been greater variation than in the buddle. They are flat, convex, concave, stationary, and rotatory; fitted with revolving or fixed arms; supplied with water, clean or dirty, in jets, streams, or drops; in short, the variety is endless. At the Clausthal Works they are rotatory and convex, and supplied with slime at the centre, while a pipe radiating from the centre, supplying jets of water, and a series of brushes attached to a wooden arm receiving a constant motion of a few inches to and fro, collects the best of the ore into a portion of the catch-pit, and the rest of this annular trough conveys the seconds to the lower buddle, where the same process is repeated. The refuse from this last is then caused to flow over a slightly inclined table, about 14 ft. long by 4 ft. wide, across which mats are placed, where the finer portions of the galena are caught, while the dirty water from these tables is led through a series of slime pits. These, about 30 in number, are arranged nearly on a level, to avoid any impetus from fall, and the water is allowed to traverse languidly a considerable number of these pits, where the last remains of the galena deposit themselves. Indeed, the extreme care taken to collect the minutest portions of ore in these works, and in others that we visited at Silberhütte, contrasted strangely with the reckless manner in which slimes are consigned to the brooks in many an English dressing-works. The total yield of dressed ore, with an average of 75 per cent. of lead and about 100 ozs. of silver to the ton, is 50 tons per month. These extensive works and the mines from which the ore comes employ 2500 hands, and yield an annual profit of 6000*l*. to 7000*l*. Two important features forced themselves upon our attention in these works, as compared with similar establishments in our own country; one was the cleanness of the dressing-floors, and the other was the fewness of men employed. Each operation was made, as far as practicable, self-acting. All the works are driven by water, which is collected with great care, and generally adjusted so as to be worked several times over at different levels.

[The author of "Notes on Continental Mining" may probably reply to Mr. Parton's letter in the next number of the *Mining Journal*.]

MINING IN THE HARTZ MOUNTAINS.

SIR,—In looking over the Journal of last week, my attention was caught by a remarkable statement in a letter in the Supplement, professing to describe the Hartz mines—that there is only one man-engine in England, that at Devon Great Consols. It will not be necessary here to point out the incorrectness of such statement; but, perhaps, you will allow me to state that your correspondent's information as to the drainage system of the Hartz mines is equally at fault. Thus, the adit spoken of as the "Augusta" is really called "Ernst August," after the ex-King of Hanover; it discharges not at Grund, but at Gittelde, in the Duchy of Brunswick, a point considerably lower down; the cost was not 60,000*l*., but 85,500*l*.; and the work was completed in somewhat less than thirteen years, instead of twenty-two, as stated by your correspondent. This confusion has probably arisen from mixing up the details of the new adit with those of the older one, driven in George III.'s time.

London, Aug. 16. H. BAUERMAN.

METALLIC MINING IN THE NORTH—No. VI.

SIR,—In the Journal of the 6th inst. you have, very opportunely, described the present position and indicated the probable future of the metal trade. The sober, common-sense view of the "situation" you have enunciated cannot fail to command the assent of all who are in any way interested in producing or trafficking in tin, copper, or lead; and while adding my mite to the general condemnation of the events that were the immediate cause of your remarks, and regret that the important tin and copper industry of the country should undergo temporary depression, entailing heavy loss, more especially to the capital and labour invested, I entirely agree with your closing remarks, that British lead mining cannot but be immensely benefited. Instead of anathemising the inordinate vanity and the ambition of Napoleon and his military parasites, whose incompacity at present seems destined in the end to prove their best scourge,—or, more fitting, condole with those who have lost or are suffering pecuniarily through the existence of this wicked war, sound policy would rather urge me to point to the opportunity that in no ordinary degree must, if rightly acted on, compensate mining investors for past loss and present depreciation, and even eventually increase the demand for and well being of our mining population, in the vigorous exploration and working of our lead mines at home.

The pithy saying, that a prophet has no honour in his own country, very nearly expresses a truth that has too often been exemplified in the past conduct of mining adventurers. Without at all calling in question the laudatory encomiums put forward as to riches, lower dues, &c., as reasons why British capital should be risked abroad working for lead, which England can and does produce in excess of any other single country, the late panic, from the effects of which we are now only painfully recovering, illustrates most forcibly the general instability attendant on investment in foreign mines. We have, indeed, numerous and constantly recurring examples of the various hindrances that contribute to hinder the attainment of the profitable results confidently predicted in the roseate prospectuses issued,—civil commotion, frequent saints' days, and innumerable minor delays, which in their aggregate result have to the cautious acted as a warning beacon; but it has been reserved for this continental war to concentrate, in all their magnitude, these seemingly isolated and local impediments into one deterring whole, the painful ulterior consequences of which will in future be more efficacious in deciding the relative advantage of home *versus* foreign mining than all that has or can be said on the matter. That the lead-producing capacity of England is capable of very great and profitable extension no one can deny; and in view of the demand for lead mines and shares in these, which has even now set in, and must extend rapidly, it behoves all interested in the welfare of the mining interest, who truly desire to see a permanent interest created and ex-

tended, to carefully guard against an indiscriminate selection, that cannot but be fatal to the permanency of the much-needed revival now in progress.

The Cornish, Welsh, and adjacent counties are well aware of the advantages attendant on publicity. Numerous individuals therein, or connected therewith, very laudably avail themselves of any legitimate facility that can give an impetus to the industry of their respective districts. It would be well for the northern counties were the same eager delineation of their capabilities regularly made for the information of that numerous class who refer to the *Mining Journal* for likely investment.

The lead mines of Derbyshire and Yorkshire, according to Mr. R. Hunt's returns, have made a joint output of over 16,000 tons of lead ore in one year, yet we rarely, if ever, hear of the details of progress, which from the latter county would be specially interesting, as there are many rich unworked mines in the Yorkshire dales which would well repay attention. Further north, on the same carboniferous range, we have the counties of Durham, Northumberland, and Cumberland, meeting together at Kilhope Head, and in a very little radius therefrom embrace a lead-producing district, the value of which may be realised when it is said that Mr. Beaumont's mines in the dales of East and West Allen, Northumberland, and of others belonging to him in the adjoining borders of Durham, furnish about one-fourth of the lead raised in England. The total of this estimate may be further illustrated were we to say that the annual produce of these mines, made into pigs weighing 1½ cwt. each, laid end to end, would extend in a straight line to rather more than 70 miles in length. The mining districts of Allendale, Weardale, and Alston, though in different counties, are contiguous, and for all practical purposes may be considered as one district, the average output of lead ore falling little short of 30,000 tons yearly. This large production is not a thing of yesterday. Referring to the statistics of the mines in the Alston manor, I find that as far back as 1718 the mines in Alston parish only returned for that and the two preceding years an annual produce of more than 8377 tons. Coming down to 1829, the output showed little variation, being computed at 8800 tons. So much for the equable character of these mines, extending over a period of 111 years; and this being so, we are prepared for the statement that follows—that from the Rampgill lode alone 72 tons of lead ore have been dug every week for more than 100 years. Combined results such as these might be thought to satisfy the most insatiable, but for the benefit of those who will be satisfied with nothing less than a Van, and who prefer, failing investing there, to dig fruitlessly in the immediate neighbourhood, we can show a find the richness of which is unparalleled in the annals of mining.

Dr. Ure, whose name is a guarantee as to the correctness of his statements, says in his well-known work (Dictionary of Arts, Manufactures, Mines, &c.) that the Hudgillburn Mine, Alston, had one vein of ore 17 ft. thick, from which 45,000 bings (2½ to the ton) were obtained in one year, of the money value of somewhere about 200,000*l*. The greater portion of the ore was solid, requiring only to be reduced to a size suitable for the market. In order to prove that there are encouraging and ample mining fields at home to suit the most fastidious, surely nothing more need be said to supplement the above. In the North we have the ore in abundance: to keep abreast of the times we need to avail ourselves of the combined effort that is preferable in the working of metallic mines to private endeavour. That such is the fact, the successful bringing out of the Holyfield Mining Company (Limited), by Mr. R. Percy Roberts, of Carlisle, is proof positive of the felt want. Unaided he organised this company some time ago to work the sett adjoining Hudgillburn, and such was his success, that not only were the shares speedily disposed of, but were soon quoted at 5s. prem. It is pleasing to know that the Holyfield Company is now within 2 fms. of the bearing sill, and it is to be hoped the spirited working of this promising sett will fully realise even more than is confidently expected. W. GIBSON.

Caldbeck.

GRANTING MINING SETTS IN THE ISLE OF MAN.

SIR,—I consider it a matter of great importance to the Crown to alter the present system of granting mineral licenses in the Isle of Man. For instance, competent parties, and men of capital, have repeatedly made applications for certain districts, with a view of making extensive explorations, but to their disappointment, the reply to such applications have invariably been that the ground in question is already secured, and in the hands of other parties. Now, I may venture to state that nearly all the mineral districts on the island have been taken up in this way, and in many instances by parties who really cannot tell the difference of a lode from a stone quarry. In several places referred to a few paltry pounds have been spent, mainly for the purpose of securing the property to themselves, and thus preventing men of capital, who are anxious to work the ground in a spirited and scientific manner. The grants I allude to have been abandoned for a considerable time past, and some places standing idle for years; yet, strange to say, that applications for such grants have been refused.—*Isle of Man, Aug.* 12. MINER.

THE MINERAL WEALTH OF IRELAND.

SIR,—In my last letter [Supplement to Journal of July 30] I referred to that class of mines which had been abandoned when on the point of becoming self-supporting, and finally highly profitable mineral-producing properties, had sufficient capital been subscribed for their further development. The western portion of the county Cork is a district of great promise, and from its highly mineralised character has induced many mines to be opened in the county, several of which are of the above interesting description. Grey and yellow copper ore have been met with at or near the surface in various parts of this district, and in some instances made large deposits close to the surface, and carrying leaders quite sufficient to induce any enterprising man to follow them to deeper and more profitable ground.

In 1845, at the DHURODE MINE, a lode was discovered in the front of the cliff, on which an opening was made, and an adit driven for several fathoms on a branch of yellow copper ore of very good description, and which yielded hundreds of tons close to the surface. More recently the mine had been sunk to a depth of 56 fathoms from surface, where the richest part of the mine yet discovered had been met with. Notwithstanding this, the deepest and most productive part of the mine was allowed to fill up with water, hand-pumps being their only means of forking the water from the mine. This mine is well laid out for extensive operations. An engine-shaft has been sunk to a depth of 45 fms., and is conveniently situated, and well calculated to prove the north part of the sett, or that portion known as the North Nine. In the North Mine, and close to the sea, are six parallel east and west copper lodes, intersected by three powerful contra quartz copper lodes, forming with these east and west bands numerous points of intersection, and at every junction yet opened on courses of rich ore have been found. Several other east and west lodes run through the property, accompanying elvan ranges, and are intersected by contra lodes and flookan cross-courses. The prospects here are most cheering, and the property doubtless very valuable, as a comparatively small amount of capital is all that would be required for the erection of machinery to drain the mine, so that the course of ore in the bottom could be worked upon, and almost immediate returns made. The mines are situate on the south side of Dunmanus Bay, and within five miles of the harbour of Crookhaven. On the east and west are the Lacka Bawn and Balteen Mines, which were formerly opened up to some extent, and produced some very rich copper ore from the same lodes which run through the Dhurode South Mine, and extend through the county both east and west, to the Lacka Bawn Mine on the one hand, and the Balteen on the other, where they in like manner prove productive.—*Cork, Aug.* 9. N. W.

MINING IN THE KIT HILL DISTRICT, CALLINGTON.

SIR,—In taking a walk around Kit Hill recently I was struck with the situation of this champion hill of East Cornwall, and, although not a believer in the old adage—"that Kit Hill well wrought, is worth London town dear bought," yet I am of opinion that the district is very rich in mineral, and in this opinion am not singular. Leaving Callington by the northern gate, I visited REDMOOR MINE, which is now being worked to a very shallow depth for tin, and is about paying cost, notwithstanding the great inconvenience of carting the tinstuff for a very considerable distance to the stamps, and also the want of a sufficient supply of water. Further north I came on to the KELLY BRAY AND HOLMBUSH UNITED. These mines were abandoned a few years ago, but are now being wrought with some energy, and returns are being made to the extent of from 10,000*l*. to 12,000*l*. a year. A most remarkable fact here is that new machinery, &c., has been erected at great cost, and paid for out of returns from the mine; and dividends also in two years are said to have been paid to the extent of 1800*l*. In the face of this, what reason can be assigned for the present low price of shares, with the advantage (as some people think) of paid-up capital, the writer is at a loss to explain. A short distance further east, on the same lodes, I visited a young mine called the EXCELSIOR. Here I found an adit being driven, which will intersect a group of lodes—four in number—at an average depth of about 50 fms., and will lay open backs for stoping, which, I think, must insure great success. These lodes are generally in killas, in close proximity to the granite. I was much pleased to see a very fine pile of tinstuff raised from one of them from a depth, I am told, from surface of only 9 fms.; and, an experienced tin-dresser from West Cornwall being with me, I requested him to try a sample or two, which he did, and the result quite surprised me. I understand a water-stamps is about to be erected here, so as in the winter months to stamp this tin for market. I heartily congratulate the shareholders as having a good property, and also for the vigorous manner in which they are working it.

My next walk was to NEW GREAT CONSOLS, the adjoining sett to Excelsior on the north, which has hitherto been worked for copper and mundic. The neighbourhood was startled a short time since to hear that tin was discovered here in the old burrows, &c., and mining agents were very sceptical of the truth of the assertion; their scepticism has, however, now given way—over 10 tons of black tin having been sold therefrom last week. A very large outlay has been made here, and the shareholders deserve (as they appear to have) a good mine.

Not having time to visit the PRINCE OF WALES MINE, which cannot be included in the Kit Hill group, but which has paid dividends to nearly the amount of invested capital, I return by way of the PRINCESS OF WALES. Here I find a mine which has been working about two years; and from the agent I gathered that a very excellent lode is opened on, and a profitably productive mine speedily anticipated. The sett is very extensive. The Wheal Brothers and Queen silver lodes traverse it for about 800 fms. in length; these lodes are parallel to, and but a few fathoms distant from, the Wheal Langford or East Cornwall silver lode.

Adjoining the Princess of Wales, on the west, is the FLORENCE AND TONKIN UNITED MINES, here I find a new company has just been formed to further develope the mines. The agent kindly shewed me a plan of the mines, also some splendid rocks of ore (copper), now being raised by the tributers. The chief object he seems to have in view, however, is a very promising lead lode, which will be speedily intersected by cross-cuts from the shaft at the 45 and 55 fm. levels. I shall not be surprised to see these mines in a short time figuring in the Dividend List.

Having finished my rambles, I needed my dinner, and returned to my lodgings much pleased; but quite astonished that such a very valuable piece of mining ground has not been earlier developed, noting as I did that none of the mines east of Holmbush, except New Great Consols, was more than about 50 fms. in depth. I have not taken my walk without becoming resolved to embark at once in some of these mines to such an extent as my pocket will allow, believing the time not far distant when shares will be sought after, and, consequently, not so easily obtained as now. PEDESTRIAN.

MINING IN COLORADO.

SIR,—The Koonce and Beverley Mill, at Central, having twelve stamps, and which is leased by Mr. Clayton, is running six of the stamps on ore from the GARDNER LODE, and six on ore from the INDIANA LODE. The former ranges from 4 to 15 ozs., and the latter about 6 ozs. of gold to the cord (8 tons).

Potter and Holly's 15-stamp mill is one of the most complete and efficient mills in the Nevada district, Gilpin county; it is occupied with custom ores. Five stamps on ore from the JONES LODE, and ten stamps on ore from the FORKS LODE. The former runs about 15 ozs., and the latter something over 7 ozs. of gold to the cord of 8 tons. No first quality from the Forks Lode goes to the smelter, but everything is put through the stamps.

The Hardesty Mill, of twelve stamps, near Central, is running six stamps on the ore from the BURROUGHS LODE, which yields 9 to 10 ozs. of gold to the cord.

The KENT COUNTY LODE, on the claims worked under lease by Messrs. Bradley and Cree, has a crevice about 4 ft. wide, from which sufficient ore is taken out daily to supply 40 stamps. Morse's mill, of six stamps, in Russell Gulch, and Bradley's, of 22 stamps, are kept continually busy from this mine, and it is understood that six stamps of Clayton's mill will shortly be engaged on the same ores. The average product is about 7½ ozs. of gold to the cord.

Gulch mining in Summit county still continues to be highly remunerative. A nugget weighing 9 oz., 10 dwts. was lately taken out of Georgia gulch.

Mr. Alex. Cameron's mining territory, in North Clear Creek, extends down the creek a mile or more. There are 5000 feet of unworked ground before the miners, which will be sufficient to furnish labour for years. There has recently been completed a flume 2 ft. deep, 3 ft. wide, and 28·90 ft. long, into which from either side all the water of the creek is turned. A force of 40 men are at present engaged there mining. The principal labour at present is devoted to the removal of the surface dirt by ground sluicing; as soon as this is discontinued, and the force put to shovelling, it is believed that three times the amount of gold will be cleaned up weekly, with no greater outlay than at present. For the week ending July 16, 38 ozs. 9 dwts. were cleaned up, and for the week ending July 23, 45 ozs. 18¼ dwts. This is probably the most extensive gulching affair in Colorado, and gives promise of becoming the most profitable.

The new stamp-mill in James Creek, Ward district, starts on ore from the ST. JAMES'S LODE. Several rich lodes are opened in this section, but the ore can only be successfully treated by smelting. The tailings from the stamp-mills carry off the bulk of the gold; the concentrated tailings containing on an average 3¼ ozs. of gold to the ton. There are scores of mines opened with ores useless for the stamp-mill, but whose richness, by repeated assays, is put beyond all question, and which could be worked if their product could be sold. The owners of these mines are much interested in the report that large smelting works are projected at the Marshall coal banks. The cost of transportation from this district to the coal banks would exceed $10 per ton. The ores could be treated much cheaper there, and consequently the owners would get a higher price for them, more than enough to pay the cost of freightage, and eventually lead to the making of a narrow gauge railway to the mines. The COLUMBIAN LODE alone would in time cause a railway to be made. This vein is opening on nearly every claim for a mile and a half in length, and all along discloses its treasures of rich refractory ore, awiting the skill and capital required for its proper treatment.

The silver mines of Grand Island district, Boulder county, are beginning to attract attention. The CARBON is at present the most important mine; the shaft is 80 ft. deep, and a drift has been started, from which ore is being taken out of a very valuable character in sufficient quantities to keep three teams hauling constantly to Prof. Hill's works. WILLIAM COPE.

British and Colorado Mining Bureau, Aug. 17.

EBERHARDT AND AURORA SILVER MINING COMPANY.

SIR,—From the time of the general meeting I have in vain scanned your columns for some scrap of information as to the progress that is being made with the erection of the new mills upon our silver mines. If, as we are told, our property is destined to occupy a similar position to that once held by the celebrated Real del Monte Silver Mines, it is to be regretted that our executive, all of whom, I understand, are largely interested in the company, do not apprise the shareholders of what is being done, if for no other reason than to neutralise the adverse operations of the "bears," who in their eagerness to sell have not considered either the exceptional value of the property nor the financial strength of the large proprietary. My object, however, is not to extol the merits of our enterprise, but to ask our influential directors to keep us fully informed, through your columns, as to what is being done.—*Aug.* 16. A SHAREHOLDER.

[For remainder of Original Correspondence see to-day's Journal.]

SPON'S DICTIONARY OF ENGINEERING.

The improvements introduced in connection with every branch of the science of engineering are so continual and important that it is almost impossible for a man with his ordinary professional business to attend to to keep pace with them, for whatever may be the particular branch in which he is engaged he is sure to find sufficient to occupy a very considerable portion of his time; yet it is essential that he should not be altogether ignorant of what is going on in other branches of it, if it be only from the frequency with which it happens that discoveries made in one branch are applicable with advantage in another, and nothing can so readily afford him the necessary information as a good dictionary. Such a work is now being issued by Messrs. Spon, the well known scientific booksellers of Charing Cross, the three first divisions concluding the first volume having just been completed. The true value of works of this character depend almost exclusively upon the ability of the editor, and in this respect Messrs. Spon have been fortunate in securing the services of so competent an authority upon engineering subjects, both mathematical and practical, as Mr. Oliver Byrne, some time since Professor of Mathematics in the College for Civil Engineers at Putney, and whose name has since become widely and honourably known as the editor of "Appleton's Dictionary of Machines, Mechanics, Engine Work, and Engineering," which has enjoyed a high reputation throughout America, yet is now quite out of date. Since 1850, as Mr. Byrne very truly remarks, numerous useful experiments have been made, important applications of the sciences to the arts developed and improved, new machines constructed, mechanical appliances invented, and new tools introduced—in fact, during the last twenty years the cultivation of the broad fields of civil, mechanical, military, and naval engineering have been so much cultivated and extended theoretically and practically that the author found that scarcely an article that appeared in his first dictionary could with propriety be introduced in the present work.

Opening the dictionary at the first page, an interesting article, Abacus, is met with, in which the principle of calculating machinery is carefully explained, and within the next few pages Abattis, Accelleration, and Adhesion are all articles worthy of study, the latter containing information relating to tractive force, which is often enquired for. Agricultural implements and agricultural machines form excellent articles. Anemometer is one in which the readers of the *Mining Journal* will take great interest—it is ably written and exhaustive; and the same may be said of Artesian Well, Assaying, Balance, Belting, Blast Furnace, and many other articles occurring within the first twelve numbers. The latter has diagrams and sections of considerable value. Of the articles Boiler, Boring and Blasting, Brake, Bridge, Canal, Cement, Chimney, Construction, Copper, and Corrosion, contained likewise within the first volume, it is impossible to speak too highly. The article on Boring and Blasting is really an elaborate treatise upon the subject; in that on Copper diagrams and descriptions are given, showing the whole process of manufacture, from the raising of the ore to the production of the finished copper.

The first volume extends sufficiently far to permit of a fair estimate being formed as to what will be the value of the completed work, and upon this point there can be but one opinion—that it will be a most important addition to the engineer's library. Mr. Byrne seems to have embodied the result of his extensive practical and professional experience in both hemispheres in the articles given, and in making these complete it is evident that neither time, trouble, nor expense (for most of the articles, it should be stated, are amply and elaborately illustrated) have been spared. With regard to the size of the work there is little doubt that the sixty one-shilling parts, of which it was at first intended the dictionary should consist, will be considerably exceeded in number, yet this will certainly not be regretted by those who have adopted the book, for the excess will only be that which is absolutely necessary to secure as near as may be perfection.

PRACTICAL TREATISE ON MINE ENGINEERING.

We have from time to time noticed the issue of the several parts of the second edition of the "Practical Treatise on Mine Engineering," by Mr. G. C. GREENWELL, F.G.S., and may now announce that the work, which is published by Messrs. Spon and Co., of Charing Cross, is completed. It was originally stated that it would consist of sixteen half-crown parts, and this number has only been exceeded by one, so that for a couple of guineas the mining engineer and colliery viewer may possess himself of a really useful practical book, which, at the same time, will form a handsome ornament to his library. The work is divided into nine chapters, embracing dissertations on the application of geology to mining; classes of rocks commonly met with in mining for salt, coal, and metallic ores; building materials; dykes, slips, and mineral veins; internal heat; metallic ores and minerals associated therewith, and with coal; smelting; boring and sinking tools; timbering; walling; tubbing; management of quicksands and clay; pumping engines and pumps; winding engines; ropes; pulleys; strength of timber, ropes, and other materials; the working of mines; underground haulage; working coal by machinery; copper; lead; tin; iron; salt; coal; ventilation; theory and practice; firedamp; carbonic acid and other gases; explosions, and other casualties; and on various other matters of paramount importance to practical men. The basis of the work in its original form was a course of lectures delivered at the Newcastle-on-Tyne College of Practical Science in 1852, when mining institutes were unknown, and works upon the subjects treated of, at least in the English language, extremely scarce. The present edition is almost entirely re-written, yet the original character of the book has been retained. The author's object has been both to instruct the beginner in the art of mining, and to aid those who are more conversant with it in the execution of mining work. The changes which have taken place in the sixteen years that have elapsed since the issue of the first edition have been great and important, and Mr. Greenwell, who has had the advantage of so much additional practical experience, has given his readers the full benefit of it, whilst supplying them with a record of the present position of mine engineering. The work is in every respect entitled to the patronage of mining engineers and mining students.

FOREIGN MINING AND METALLURGY.

The French iron trade shows little animation; one cannot be surprised at this, having regard to the anxieties involved by the Franco-Prussian conflict. In the Champagne district sales have proceeded with less activity, except as regards sheets and merchants' iron. The business done in castings shows no improvement, and the prospects opening out for the winter in this respect are unsatisfactory. An advance of 4s. to 8s. per ton has been made in merchants' iron; this advance has been occasioned by various circumstances, such as the suppression of deliveries of coal from Prussia, the suspension of navigations at certain points, and the advance in the price of coal and coke in the Nord and Belgium. MM. Hamoir and Co. have taken a small contract for 56 tons of Vignoles rails for the Northern of France Railway Company, at 8*l*. 8s. per ton in warehouse at the works. The Southern of France Railway Company has ordered from the Terre-Noire Company 100 tons of Bessemer steel Brunel rails, at 12*l*. 8s. per ton, delivered at Bordeaux. The Creusot Works have obtained a contract for 20,000 tons of cast-steel rails; the price is 10*l*. per ton, taken at Creusot. The Turkey in Europe Railway Company has ordered from the Terre-Noire Company 1000 tons of Bessemer cast-steel rails, at 11*l*. 7s. 3d. per ton, delivered at Constantinople; and 6000 tons, delivered at Marseilles, at 10*l*. 12s. per ton. Complaints are made that the war traffic passing over the Eastern of France Railway has grieviously disorganised the transit of combustibles and minerals, and that forgemasters have sustained much loss and inconvenience in consequence. These complaints are, no doubt, well founded enough, but it is difficult to see how they could be obviated under the circumstances. The Paris, Lyons, and Mediterranean Railway Company has given out an order for turn-tables, at 13*l*. 12s. per ton in warehouse at the works. The Eastern of France Railway Company has ordered some hydraulic cranes from MM. Capitain and Salin, at 11*l*. 8s. per ton, in warehouse at Joinville. The Western of France Railway Company has ordered a quantity of wrought-steel crossings from MM. Boigues, Rambourg, and Co., and MM. Revollier and Bietrix, at 19*l*. 2s. 10d. per ton, delivered at Batignolles.

The Madrid, Saragossa, and Alicante Railway Company has concluded contracts with the Belmez Colliery Company and the Ciudad Real and Badajoz Railway Company. These contracts assure the Madrid, Saragossa, and Alicante, both as regards 1869 and some future years, a reduction of nearly 4s. per ton in the price of the coal intended to be used on the system, the quantity of which ranges at between 36,000 and 40,000 tons per annum. This economy, coupled with the reduction made in the Customs duties imposed on foreign coal imported into Spain, will exert a favourable influence on the locomotive department, by placing the cost of the combustible consumed on the hitherto unfortunate Spanish railway at as nearly as possible the same level as that attained by other European railway undertakings.

All descriptions of coal continue in demand in Belgium, and great activity is especially noticed in the deliveries made to France and Holland. There are still complaints as to the scarcity of rolling stock. Prices remain well sustained. The journals of the district announce a strike of miners at the Flénu Colliery, and there were some apprehensions that this example might be followed in other coal workings, notwithstanding the sacrifices made by coalowners in favour of their workmen. Somewhat puerile causes are assigned for these strikes, and under any circumstances the moment selected for them seems ill-chosen. The last advices on the subject tended to a peaceful and satisfactory solution of the various difficulties. Contracts have been let for various articles for the Belgian State Railways, but no English firms have participated in the orders given out. One of the contracts was for ten locomotive tenders, and was let to MM. Cabany, of Gand, for 1511*l*., or 151*l*. per tender. Another contract was for 20 axles of Bessemer cast-steel for tenders; let to the Cockerill Company, of Seraing, for 107*l*. Another contract was for 20 wrought-iron wheels, of 6 ft. 8 in. diameter, with Bessemer steel tyres, for mixed locomotives; let to the Cockerill Company, of Seraing, for 65*9l*. The Belgian Government has shown itself well disposed to come to the aid of the metallurgical industry of Belgium in the trying circumstances in which it is now placed, by ordering a considerable quantity of railway *materiel* from the various forgemasters. Thus, a first order for 15,000 tons of rails has been given out, and it will be followed by another for 35,000 tons, as soon as negociations with reference to the prices to be paid have been satisfactorily carried through. A proposal has also been made with reference to the giving out an order for locomotives, not that the State lines are not pretty well supplied with engines, but in order to give employment to that department of the national mechanical industry which occupies itself with this description of work. An agreement has been nearly arrived at with reference to the mode of payment, but this one matter remains in dispute. The locomotive builders desire to be paid in cash; the Government proposes to pay them in short-termed Treasury Bonds. As these bonds are easy of negociation, it would seem that the firms likely to tender would do well to accept them in payment for their deliveries.

The foreign metal markets have not presented any particular feature, except a rather decided advance in the price of tin. In Holland the war news has acted strongly on the price of that article, which has risen to 75 fls. for Banca, and 72½ fls. for Billiton. It is difficult to assign any real cause, however, for this rise. Stolberg lead has risen to 11¼ fls. at Rotterdam; there are some orders on hand for Russian houses, which cannot be executed, the stock at Rotterdam being almost *nil*.

BRITISH REPUTATION ON THE CONTINENT.—There never was a greater misrepresentation of fact than the frequent statement by military officials, and their parliamentary or journalistic friends, that British reputation on the Continent has suffered from the adoption, during the past few years, of a pacific and non-interfering policy. It is quite the reverse. The continental nations entertain a greatly increased respect for Englishmen when they see them unwilling to squander their hard-earned taxes, or freely sacrifice their soldiers, on foreign battle fields. Whereas, in former times, when under Pitt, Castlereagh or Palmerston, an aristocratic clique at home found it to their class interest to check popular freedom by profuse subsidies of men and treasure to continental

nations, the latter could scarcely conceal their sneers even at the very time when the stream of British prodigality was pouring upon them. "John Bull is a great fool" was the popular verdict of Spaniards, Germans, Greeks, Belgians, Austrians, French, and Turks. Spain and Germany, for whom we made the greatest sacrifices, were the most ungrateful of all, and laughed the loudest at our foolish generosity. And so it will be again if British blood and treasure shall be afresh squandered on any part of the Continent. The Americans are wiser. No such foolish "loans," "subsidies," and "material guarantees" emanate from Washington. Nor should laborious and struggling Englishmen ever again empty their pockets and pour their blood on ungrateful and sneering foreign recipients.

FOREIGN MINES.

ST. JOHN DEL REY.—The company have received the following report, dated Morro Velho, July 16: Morro Velho produce for June, 9045 oits., from 3775 tons ore; yield, 2·395 oits. per ton; Morro Velho cost for June, 3486*l.*; loss ditto, 990*l.* Morro Velho produce, 11 days of July, 2570 oits.; yield, 1·717 oit. per ton.

DON PEDRO.—Mr. F. S. Symons reports, for June: Produce, 6697 oits., at 8s. 6d. per oit., 2846*l.*; cost, 3203*l.*; loss, 357*l.* Nothing new to advise in mine, ore excavated poor, none sufficiently rich for boxes.—First division of July: Produce weighed to date, 1502 oits. I much regret disappointment as to drop in produce; it has been shared by all here. Had No. 6 not failed, our expectations would have been more than realised. No one could form an estimate of the value of the reserves excepting after treatment. As to quantity we were right; a long space of time must elapse before they are exhausted, and, though poor at present, no one can say what they may yet give. The lodes struck in Alice's west must alone present a large field for exploration. All here conversant with maquine and jacotinga lodes are sanguine that, in connection with them, we shall yet encounter riches. The present year should be considered an exceptional one, as the cost is unusually heavy, owing to expensive works in progress for drainage and quarrying in depth. I hope 1871 will be as fortunate for us as this has been the reverse. I base my opinion on the following facts:—By the end of next month the water-wheel will replace animals in driving the horse-engine, save a heavy cost, and, with the increased power, the sinking of Vivian's shaft will be resumed. After sinking about 3 fathoms from the present bottom we shall drive beneath the stopes at present under water, and drain about 16 fathoms. The sinking of shaft will continue and drainage proceed."

ANGLO-BRAZILIAN.—Mr. F. S. Symons reports for June: Produce, 2831 oits., at 9s., 1273*l.*; cost, 1573*l.*; loss, 300*l.* Notwithstanding a short month, with an unusual number of saints' days interfering with attendance of the force, I am pleased to report an increase in the produce on that of May of 239 oits., and also in the standard of mineral treated. The stone throughout has yielded better than in May. In Foster's section there is an improvement in appearance of stone; we are striving every effort to unwater the Fundao at a deeper horizon, and hope the stone will turn out more auriferous than it has yet done. We have not yet reached the lodes that the old proprietors last worked on, until obliged to abandon them through force of water.—First division of July (extract from letter, dated July 17): Force is improving. Samples show a trifling amelioration to those of last month, and the sick list is favourable.

GENERAL BRAZILIAN.—Capt. Thomas Treloar reports, under date July 16: The operations generally to date have presented no feature calling for special remark. Everything is going on well, and the health of the establishment continues good.

CHONTALES (Gold and Silver).—The directors have advices from Mr. Belt, dated July 7. Produce of gold for the month, 352 ozs. from 902 tons of ore; average yield, 7 4-5 dwts. per ton; value, $4877. Cost for the month, $4699. Mr. Belt reports: "I am carrying out my plans of treating the large and almost inexhaustible supplies of moderate value at lower depths, and the results of the past month's operations proved how cheaply we can now deal with our ores, and fully substantiate my opinion that, with sufficient machinery, and a large output of ore, we could return a fair profit on an average yield of 5 dwts. per ton. There is now abundance of water-power, and we have this month re-commenced grinding the tailings. To the westward of all our present workings on San Antonia we have commenced a level on the outcrop of the lode, which will give us speedy access to 10 fathoms of backs below No. 5 level, and I have strong hopes that we shall find a large quantity of profitable ore. The delay in stoping the ground westward has arisen from our having to re-timber the whole of the No. 5 level, which, during the revolution, ran together." The health of the establishment is good.

San Antonio Mine.—July 5: No. 1 stope, in back of No. 5 level, west of Piper's shaft, has been stoped 64 varas; lode 2 ft. wide, worth 7 dwts. of gold per ton; this stope is completely worked to the surface. No. 2 stope, in the back of the same level, west of Piper's shaft, has been stoped 71 varas; the lode is 3 feet wide, worth 10 dwts. of gold per ton. No. 3 stope, in the back of the same level, east of Piper's shaft, has been stoped 41½ varas; lode 4 ft. wide, worth 8 dwts. of gold per ton. A stope in the back of the deep adit level has been stoped 52¼ varas; the lode is 3 ft. wide, worth about 4 dwts. of gold per ton. No. 5 level, east of Piper's shaft, has been driven on the course of the lode 7½ varas; lode 3 feet wide, and worth about 4 dwts. of gold per ton. No. 5 level, west of Piper's shaft, has been driven on the course of the lode 3¼ varas; lode 2½ feet wide, worth 6 dwts. of gold per ton. In driving on the course of Santo Domingo lode, east and west of shaft 7 varas, the lode is 4 feet wide, worth about 3 dwts. of gold per fathom. We have commenced driving a new level on the course of the lode east of Trinidad valley; this level when driven under Nos. 1 and 2 stopes will be about 60 ft. below No. 5 level, and open up new ground to that depth. From the appearance of the lode in No. 5 level, west of shaft, I believe this to be a good piece of ground, and easily taken away. The quartz sent to the stamps for the past month was 902 tons, which I estimate at 7¾ dwts. of gold per ton, in all about 352 ozs. melted gold.

Trinidad report for June: This month the rise in the back of Trinidad level has been put up 17½ varas; lode 2 ft. wide, yielding a little gold, but not sufficient to value. We have about 8 varas more to communicate the above rise to surface, which I hope to get completed in three weeks. We have also driven a cross-cut south 5½ varas to cut the south part of the lode, but as yet nothing has been discovered of any value. The deep cross-cut at Santo Domingo has been driven 18½ varas, and a new tram-road put into the end.—WM. EVANS.

ROSSA GRANDE.—Mr. Ernest Hilcke reports for June: The gold return for the month amounts to 401 oits., derived from 170 tons of ore; yield, 2·36 oits. per ton; total cost for the month, 1136*l.* Operations have not progressed with the wonted speed, owing to a low attendance of force. In Mina de Serra little alteration has taken place. The lode in the 56 and 60 is of good size, but the auriferous quality of the stone is very poor, and yielded only 2·36 oits. per ton. In Cachoeira Mine since my last a level has been driven through old workings 5 fathoms west of adit, on course of the lode. So far the lode is poor, but, from information received, about 25 fathoms further west we shall meet with a highly auriferous lode. In Gongo Mine we have met with a change in the jacotinga; its nature is more favourable for auriferous deposits.—First Division of July (extract from letter dated July 16): The diminution in the gold percentage of the lode in Mina de Serra at the 56 and 60 fathom levels has decided us to discontinue operations at those places. In Gongo Mine we commenced examining the jacotinga in a gully situated about 150 fathoms west of Angove's shaft. The majority of the samples taken have shown fine particles of gold, and greatly encouraged our hopes of a finally worthy discovery. We have also begun cleaning and securing the mouth of an old adit in order to ascertain if its present state is in working condition. This adit was opened by the Imperial Brazilian Company for the purpose of working the south jacotinga, but before its completion the company discontinued operations.

CUIBA (Gold).—The directors have received the following report from their superintendent, dated July 14:—We have now been in possession of the several properties just one month, and a great deal of work has been done in that short time towards our reaching the several lodes by continuing Vivian's level, and we have also employed just sufficient hands upon the superficial workings to provide stone for the spalling-floors. Five hands have spalled stone for 20 days during the last month, producing 210 oits. of gold, leaving the sand for re-treatment. This is an earnest of what will be done upon the completion of Vivian's level, exposing the several rich lodes, and enabling us to employ a large labour force.

ALMADA AND TIRITO.—The following telegram relating to the working of the mines for the month of June last has been received by the directors of the company from their chief engineer, Mr. J. P. Clemes, dated July 4:—Estimated total produce for month in cash, $13,096; cost for month, $8095, including some extra charges; capital expenditure, $13,013; tons of ore crushed for month, 238; ley of ore, $50 per ton. Labour scarce. Tirito driving to north lode disturbed; ground improving towards the south in Providencia. No change elsewhere. Lode as productive as before. Correspondence of April 30th received: Country quiet. Eight tons of Pitanque ore in stock. Preparing to ship.

TAQUARIL (Gold).—Mr. T. S. Treloar report for June states that the old excavations on rich shoot of gold in top lode were reached on 25th by 15 fathom level from engine-shaft, and a large quantity of water and choke-damp let out. Owing to the accumulation of crushed matter, a poor examination only has to date been made of old workings; but, notwithstanding, enough has been seen to convince all parties here that the company is in possession of a mine of no ordinary character. All the samples taken from lode standing at sides, and from crushed matter aforementioned, have proved auriferous, and two small (sampling) boxes of stuff extracted from a part of the shoot itself, yielded very fine samples of gold. Excellent samples have also been taken from a pipe vein westward of, and running parallel with, the shoot. In this lode there is an auriferous jacotinga formation, as well as more gold-bearing lines; and in the under lode upon which there are some extensive workings, several gold-bearing veins are said to be contained, but until the debris has been removed, and the excavations well secured with timber, the sampling operations will necessarily be limited. The bottom of the old engine-shaft is about 6 feet deeper than the horizon of the level. A stamping mill and other appliances for treating the ore are in hand, and he need scarcely add, will be pushed on with all possible dispatch. For the first division of July, Mr. Treloar reports that he had the pleasure, on July 6, of desiring Messrs. John Moore and Co. to transmit to the directors, per earliest opportunity, the following telegram:—"Two shoots of gold discovered, one in top lode, and the other in under lode, near bottom of the old engine shaft. Magnificent samples of gold taken from both. Bed of jacotinga contained in top lode found, and fair samples of gold extracted therefrom. Nearly all the crushed matter from old workings is auriferous." About 70 tons of crushed matter, most of which is auriferous, have been removed from workings in neighbourhood of old engine-shaft and brought to surface, where it will be kept in security until the appliances for treating same are in readiness. From what can now be seen, the two lodes are running parallel, and within 6 feet of each other, a bar of unproductive white sandstone being the intermediate element. In the top lode they have thus far met with one good shoot of gold, two pipes veins (or gold-bearing lines), and an auriferous bed of jacotinga, the whole dipping in a S.E. direction, and within a few feet of each other. The shoot is about 2 feet in thickness, and three small boxes of stuff broken from it have yielded magnificent samples of gold. In the under lode, which is principally hard sandstone, our discoveries to date are a shoot and two gold-bearing veins, composed of killas, quartz, and sandstone, varying in thickness from 6 in. to 1½ feet, all dipping in the same direction as the veins in top lode. This shoot was struck on S.W. side of old shaft, about 8 feet from bottom. It is composed of three layers of auriferous matter lying one over the other—sandstone, killas, and quartz, imbedded in sandstone; is about 3 feet in thickness, from 6 to 7 ft. wide, and yields extremely rich box work, some pieces of gold weighing as much as 2 ozs. troy. N.W. of old shaft there are extensive workings, and at this point they have met with same shoot, and extracted about a ton of very productive stuff. Several general samples have been taken from both lodes, and nearly all show excellent work for stamps. More old workings still have to be examined, wherein other veins will unquestionably be found. But even in the event of our meeting with no more, the discoveries already made are sufficient to warrant my asserting that the company possesses one of the richest gold mines in Brazil. Since communicating to old workings altogether the quantity of ore pulverised in a mortar and washed in the sampling room amounts to about 3 tons, which we have derived 102 ozs. 3 dwts. troy of gold, besides some very fine "specimens." This result cannot but be pleasing in the highest degree to all connected with the concern. The surface works are progressing satisfactorily. Stamping mill and other appliances for treating the ore are being pushed on with all dispatch, and every nerve will be strained to have the same ready as early as possible, but withal some three months must elapse before the stamps will be in readiness. The following telegram will be sent to the board per this steamer, by Messrs. John Moore and Co.:—"102 ozs. troy clean gold in my possession, extracted from about 3 tons of ore broken from various points at bottom of old workings." On Aug. 8 he will forward to the Don Pedro establishment for transmission to Messrs. John Moore and Co., per gold troop, all the gold and nuggets extracted to that date.

PACIFIC.—Advices have been received from the manager at Lander Hill Mine, dated July 22, as follows: The 550 ft. level south is more favourable for driving; the 550 ft. level north-west much the same. In the 400 ft. level, west of engine-shaft, we have to-day intersected the lode south of the break—here I hope to have a good lode. In the rise in the back of this level we have cut the lode south of the break, but not yet out of disordered ground—lode producing good stones of ore.

Upon July 28, Capt. Brown writes: In the 400, west of shaft, we have got the lode south of the break—it is 18 in. wide, from which we are taking some fine stones of ore. I think as we get further off the break the lode will improve. The rise in the back of the stope the last day or two has very much improved—lode 15 in. wide, producing some fine stones of ore. I think from its appearance to day we shall have a good lode shortly, as the ground about it is looking considerably better, and is of a promising character.

BRAGANZA (Gold).—Mr. W. H. Richards and Capt. Roberts report that the deep adit has been driven 5 fms. this month, and they have intersected a lode about 2½ to 3 ft. big, composed of veins of hard quartz, slate, iron, and friable quartz; several samples have been washed, and all show gold. They do not consider this to be the lode cut in the tramroad level, and so continue pushing on this adit. The new tramroad cross-cut has been driven 3 fms. 1 ft. 1 in.—total, 24 fms. 5 ft. 4 in.—and has intersected the main and most western lode yet seen; this is the same lode that produced such good samples in the shallow cross-cut. They have driven through this lode and its branches 11 feet, and they do not consider they have got the footwall as yet. The samples show gold in the batea, and will prove fair stamping work; this looks well, and will give us more than 300 ft. of backs. The produce of six samples assayed by a first-class assayer, who himself selected the stone, and who states that he rejected such as showed free gold, shows that some of the stone yielded 20¼ ozs. per ton, and that the average of the six assays is 5 ozs. 7 dwts. 9 grains, or 46·66 oits. per ton. The small stamping-mill is now completed, and they have received the iron requisite for a tramroad. Surface work progressing well.

[For remainder of Foreign Mines see to-day's Journal.]

The Royal School of Mines, Jermyn Street.

MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE L.—Mr. SMYTH next proceeded to the subject of the ventilation of mines, which he said would require for its full discussion a whole course of lectures, but to which he should only devote four or five. The great number of accidents which had of late occurred from the want of proper ventilation had directed public attention very much to the subject, and ideas were current that both metalliferous mines and collieries were extremely deficient as regarded the systems adopted, and the extent to which ventilation was carried. He did not deny that there were both mines and collieries to which criticism of this kind was applicable, but, as a rule, the critics were profoundly ignorant of what was done, and of what was possible to be done. Everybody, however, knew that there were certain atmospheric conditions under which animal and human existence was impossible; and these conditions were exactly those which the miners had to contend with. The deadly effects of carbonic acid gas were frequently manifested even in such small operations as sinking a well; and few weeks went by in which there was not recorded in the newspapers melancholy instances of loss of life arising from the neglect of precautions which most people knew were necessary for safety. It was not uncommon for well-sinkers—a class of men engaged, perhaps, all their lives in such work—to descend in a morning to their labour without any precautions or effort to ascertain the state of the atmosphere into which they were about to enter. Hence, in spite of all their experience, that class of men continually meet with fatal accidents. In mining, the very same atmospheric conditions were not unfrequent, and many others not less dangerous and difficult to deal with. But mining managers and engineers had studied the varied problems thus presented to them so completely as to render the ventilation of mines a matter of almost exact certainty under ordinary circumstances, and of complete effectiveness where no unusual outburst of gases occurred. The very nature of the work done in mines, and particularly in collieries, created difficulty. Thus there were not only the deleterious gases evolved from the face of the coal, and from the roofs, floors, and walls of the various excavations, but the air was often clogged with the smoke from gunpowder used in blasting, and with the particles of fine coal dust, which resulted from breaking the mineral away from its natural bed. There were four or five gases, which were extremely dangerous and destructive, and no system of ventilation could be considered satisfactory which did not sweep them away as fast as they were generated.

Before entering into the science of ventilating mines, it was highly necessary to be acquainted with the nature and property of the air and the gases he had alluded to, for there was no more prolific source of accidents than a dangerous ignorance of these potent agents of evil. Besides the actual chemical constituents of the gases, their fluidity, weight, and elasticity must be specially considered. The air was apt to become more or less vitiated after having passed a small distance into the workings. There were added to it various noxious ingredients, such as the products of combustion, respiration, the decomposition of organic matter, and the gases evolved by the mineral deposits, such as arsenical vapours, sulphurous acid, carbonic acid, carbonic oxide, sulphuretted hydrogen, and carburetted hydrogen. With respect to all these the men were exposed to considerable injury to health, and special precautions were needed. Those accustomed to certain tin works, where arsenical matter is deposited, can smell it for a considerable distance. The results of bad ventilation are visible in several different ways. A serious obstacle to work is want of light, owing to the powder smoke not clearing away. The candles then will only burn when held nearly horizontally, and frequently one man is required to hold the light while another works, and besides this, the men breathing in such an atmosphere seriously injures health. Men ought not to be allowed to work under such conditions. On a warm summer's day, when there is no movement in the air above ground, in places where there is ordinarily a tolerably good ventilation, there may come a total want of circulation, so that the miners burn a whole bunch of candles at once to obtain but a small modicum of light. One of the earliest modes of renewing the air in the workings of mines was to beat the air with a cloth, which is somewhat analogous to the colliers beating fiery gas out with their jackets. The discoveries of Prof. Graham, the Master of the Mint, showed that gases had a strong tendency if left alone to mingle with each other, but nevertheless, although this diffusion undoubtedly took place to a certain extent, and where the gases were in a state of rest, yet in mines they might depend upon finding them arranged according to their specific gravity. They must recollect also that these were mixtures of these gases, and that some of them were the most dangerous enemies which the miner had to combat. It was, therefore, very desirable to be familiar with their chemical constituents, and with the conditions under which they were found arranged in a mine according to their specific gravity. Above the water flowing along the floor of the level, came, first, sulphurous acid; upon that would be found carbonic acid (specific gravity, 1·524); above that atmospheric air, occupying, as it were, the middle line; next in order came carbonic oxide (specific gravity, 0·970); above that would occur sulphuretted hydrogen; then nitrogen, of which the specific gravity was 0·976; and, lastly, carburetted hydrogen. Considering these gases as occupying different portions of a mine they must recollect, for this was a point most absurdly neglected, that if any of these lighter cases happened to be present in the workings deeper than those in which the men happened to be working, they would have a tendency to rise up into the position of the heavier gases in the works above, so that if they had a seam of coal or shale, which gave off carburetted hydrogen below a well of water, such as a sump, the lighter gas would tend constantly to rise up through the water and get into the workings above. Many explosions had occurred from ignorance of this, it being generally supposed that water was a positive barrier to the passage of gas. This was a very fallacious notion, as was proved by the circumstance that gas had in some cases bubbled up through a deep river, and been set on fire at the surface. The burning springs also afforded examples of this phenomenon. The first gas they had to deal with was "carbonic acid," which, from its great specific gravity, was always inclined to accumulate in the lower workings. If this gas were present in the proportion of from 5 to 8 per cent., combustion was rendered difficult, and if it became as much as 10 per cent. the candles would go out, and any proportion beyond that was dangerous to life.

An extraordinary instance of the presence of this gas in considerable quantities occurred at a colliery at Pontgibaud, in Central France, where the most powerful ventilating apparatus was required to carry it off, notwithstanding which the men were occasionally obliged to leave their work on its account. This was an exceptional case, but nevertheless in many of our collieries they might have such an exudation of this gas as to put out the lights. Lime water had been sometimes used to get rid of this gas, but a powerful current of air was best. "Sulphuretted hydrogen" was a most poisonous gas, but it did not often occur. It had been recognised in the Whitehaven collieries, where it was given off by the decomposition of iron pyrites, and bubbled up from the old workings. In the Townly Colliery the men cut into a feeder in the stone drift, which contained a quantity of this gas, but it was nowhere found if the water was fresh. With regard to the middle stratum, composed of the common air, it must be considered in various ways. The miners call everything "damp"—black damp, white damp, choke damp, &c., but what they meant was the common air vitiated by being deprived of a portion of its oxygen by the breath of men, by powder smoke, and by a great number of chemical agents in the rocks through which the levels were driven, brought into a state of activity by their tendency to decompose, which made it easier to maintain proper ventilation through one ground than through another. "Nitrogen" was the atmospheric air deprived of its oxygen. "Carbonic oxide" was a production rarely to be met with in collieries, but it should be guarded against on account of its poisonous properties, and it is strongly suspected, if not proved, to have existed in the mine at the time of the great Hetton explosion some years ago. "Carburetted hydrogen" is what is called fire-damp, and designated by the French miners *grisou*, and by the Germans, *schlagendus wetter*. If it exuded in a pure state it might be set on fire without danger, and it then burns with a pale blue flame, but if it were mixed with four times its bulk of atmospheric air it would explode, but most violently when there were from seven to nine times its bulk of air mingled with the fire-damp. Those accustomed to carburetted hydrogen were aware of its different qualities and powers according to the proportions in which it was present in the air; but other gases are often mingled with it besides common air, and therefore their judgment cannot always be depended upon for safety. This gas was almost exclusively confined to coal and limestone mines, there being few instances of its presence in metalliferous workings, and amongst which were Clausthal, in the Hartz, an old mine near Rhyl, and Okel Tor, on the River Tamar, where a sudden outburst occasioned a dreadful accident.

LECTURE LI.—In our last leeture we discussed the various gases and the mixtures of them, which often occasioned the miner great difficulty and much danger while working. To-day we will consider some of the means used by miners to free the workings from these gases. This is in many cases done by what may be called natural ventilation, which not only frees the levels from noxious gases, but supplies the miners with sufficient air. It is, as we have seen, of great importance to attend to the specific gravity of these gases, as a good knowledge of their properties are often the means of preventing serious accidents. The two most dangerous gases are known as "fire-damp," and "choke" or "black" damp. The fire-damp being very light is generally to be found in the higher parts of the mine. Thus if a seam of coal were worked by a number of ascending levels the fire-damp would accumulate at the top of each level, and render the working dangerous. This will show you the necessity of introducing into the workings a regular system of, so to speak, drainage of the gases. There are many instances on record of accidents which might have been prevented by proper precautions. The question is, therefore, to find out to what extent it is necessary to drain a mine of fire-damp, in order to render it comparatively safe. In many cases one seam may by means of an adit level be made to relieve a lower seam, and thus expel large quantities of "blowers" from the mine. Where a thorough discipline can be established the gases may break out in vast quantities, and yet do no harm. An instance of this occurred not very long ago at the Oaks Colliery, near Barnsley, which was of such an instructive character that I will give the details of this case at some length. It shows the importance of working a fiery mine with safety-lamps alone, and of taking the return air into the upcast shaft without passing it over the fire of the ventilating furnace. Between four and five o'clock in the afternoon, whilst the colliers were at work in some banks down the engine plane, a sudden outburst of gas took place from the floor of what is called the Barnsley seam. The gas issued from various places along a distance of 50 yards, but at one point the escape was so violent as to be compared by those who heard it to the blast rushing into a blast-furnace, and by others to the violent escape of high-pressure steam from a boiler. For the last five years this pit has been worked with safety-lamps, the hewers being supplied with Stephenson's, and the hurriers with Davy's. Upon this occasion the whole of the Stephenson lamps in use in that district for a space of 500 yards were extinguished almost instantaneously. The Davy lamps were filled with fire, and became red hot, and several of the persons using them were burned on the hands by the gauze. Very fortunately the men at this colliery have become accustomed to use the lamps properly, and the lights were carefully extinguished by drawing down the wicks. In less than an hour from the first appearance of the gas it had nearly passed away, the only traces being at one or two places on the floor, which was much heaved up, where it would fire in the lamp. A large quantity of air was passing this district, and at the point where it met the gas was perfectly fresh, that being the first working place, and only 100 yards from the engine plane, which is the main intake; but no amount of ventilation could have diluted the gas below the firing point in the vicinity of the place whence it issued. Mr. Brown, the viewer at the Oaks Colliery, is fully convinced that if there had been a naked light in this district of the pit; if any of the safety-lamps had been out of order, or dirty with oil or coal dust; if one of the Davy lamps when they become so hot had been dropped upon the ground; or if the return air had passed over the furnace a distance of 800 yards from where the gas came off, that in any of these cases a fearful explosion must have resulted the cause of which, like many others, probably never being known. As there is a possibility of a similar event occurring at other collieries, this is a matter worthy of our most careful consideration.

In metalliferous mines, as I have already stated, fire-damp seldom occurs, but remarkable instances of its presence do transpire from time to time when the ground approaches the character of the coal measures, and in the black shale and other beds connected with carboniferous limestone. Cases have occurred in the Hartz, at Talargoch, and more recently in Flintshire, Montgomeryshire, and Okel Tor (in Cornwall), where certain parts of the works had to be abandoned for some time on account of a violent incursion of fire-damp. When we consider the considerable decomposition which is continually going on in mines, the presence of fire-damp and other deleterious gases cannot be wondered at. The temperature of a mine increases as we descend, and after a certain depth is no longer affected by the changes at the surface of summer and winter. The increase of heat is variable, and differs in different classes of rocks. Fire-damp, however, is much affected by atmospheric pressure, and at some parts of the year it is more prevalent and abundant than at others. The late George Stephenson made some very interesting experiments with respect to "blowers" and deleterious gases. He noticed that the emission or non-emission of gas from the coal in a mine can often be indicated by the use of a barometer. Thus when the barometer is low we may be tolerably certain that fire-damp is exuding in large bodies, but when it is high there will be a much less quantity. This is found to be the case particularly when the effects are observed on some continuous blowers, natural jets of gas being kept back entirely in certain states of the atmosphere. The barometer, therefore, is a most useful instrument to keep both in the mine and at the surface, and its rise and fall should be carefully and systematically watched and noted. When the barometer is lower than usual extra precautions must be taken. I once visited a certain mine in the South of France, and when there I found the mine full of noxious gases. The barometer was very low, and a strong gale from the south-west was blowing. It was a very stormy day, and the gas in the mine was so bad that the men were all obliged to leave their work. Warmth of temperature must be taken into consideration in ventilation, and we find that a cross-cut through pyrites will be quite hot. An instance of this is to be found at the Monte Catini Mine, in Tuscany, where the natural heat is from 80° to 86°. It requires strong men to work in high temperatures. In most mines, however, varying in depth from 250 to 320 fathoms, the temperature is below 80°, and they are very seldom higher than 86°. We must not, however, be led away with exceptional cases of this kind.

Now, let us turn from this subject to the conditions under which the air may be supplied in sufficient quantities to the miners. In the great majority of metallic mines it is found to renew itself, and to form a natural ventilation. As the difference of temperature between the air at the surface and the air below is the cause of natural or spontaneous ventilation, it is obvious that if two shafts of the same size were sunk and connected with each other by a level underground the column of air contained in both shafts will balance each other. If one shaft is made longer than the other the column of air it contains forces itself by its own weight along the level and up the other shaft, thus producing a current of air. This process in a large number of cases goes on without the help of any artificial means, and there are a great many mines through which very large quantities of air are forced in this way. This plan is chiefly employed in the hilly districts of Devon and Cornwall, besides many of the Midland districts of England, where the workings are not subject to fiery gases, and where the deterioration of the air arises principally from the vitiating effects of the breath of men and horses, of the combustion of candles, of gunpowder smoke, and from various impurities of that kind. At certain times, and often when the wind is in a particular direction, especially if the shafts are not very different in depth, there will be an equilibrium, and the air will stagnate. Artificial means must then be resorted to, and one of the shafts lengthened by a stack or tower of masonry, about 50 or 60 ft. high, which will make a decided difference between the two columns of air. In ancient times it was usual to build a stack over the pit, and to attach to it a furnace accessible at the surface through doors, and in some pits this mode, or that of suspending a fire-grate in the shaft, may perform good service. If, however, a really large volume of air is required, we must heat the full height of the column in the upcast shaft, and by a good brick lining and prevention of the dropping of water obtain a maximum effect, and the greatest possible difference of temperature between the upcast and the downcast shafts.

Another method of rendering spontaneous ventilation effective—a very old remedy, and used to this day—is the application of horse-heads or cowls at the top of the shaft. When in trial work there is but one shaft, divided down the middle with a brattice cloth, horse-heads or tub vanes are put up, and the mouth of one kept facing the wind, and the other in the contrary direction, the air being thus carried down by the one and up by the other. A second cowl is often employed for the purpose of getting rid of the foul air brought to the surface by the upcast, and if any wind be stirring at all this is a very easy method of effecting that purpose. Pipes are now being much used in small mines and exploratory workings for ventilation with considerable success. They are usually made of wood, carefully fitted, and the joints clayed so as to render them air-tight. These wooden pipes have, however, had to give way lately to cylindrical air-pipes, made of zinc, which, although thin, are very advantageous. Being light they can easily be put up, but they are also easily damaged. Strong cast-iron tubes are now being generally used, their weight being the only drawback. Many other materials have been tried, as, for instance, *papier maché*, but it is found liable to be quickly destroyed by dampness. These pipes should be as large as possible, and the larger they are the better, as they then do their work more efficiently. In coal mines pipes are dispensed with as early as possible, in order to employ the levels themselves for ventilation, so that instead of a tube 6 in. in diameter the air passage is 6 ft. by 6 ft., through which large volumes of air are passed. Another plan is that of sinking a pit of small dimensions by the side of the main shaft for the sole purpose of ventilation. This is called "trumpeting," but this and other similar contrivances are only suitable for diminutive workings and small quantities of air. [The lecturer illustrated his remarks by numerous models and diagrams.]

THE BRITISH ASSOCIATION.—The members of the British Association for the Advancement of Science will hold their annual meeting this year at Liverpool, under the presidency of Prof. Huxley, LL.D., F.R.S. The first general meeting will be held on Wednesday, Sept. 14, in the Philharmonic-hall, when Prof. Stokes, of Cambridge, will resign the chair, and Prof. Huxley, who will succeed to it, will deliver an address. On the following day the Mayor of Liverpool (Mr. Hubback) will receive the members of the association in the Town Hall. On Friday, the 16th, Prof. Tyndall, will lecture in the Philharmonic Hall, and the Mayor will hold a second reception in the Town Hall. On Saturday, the 17th, Sir John Lubbock, M.P., will deliver an address to working-men in the Concert Hall, Lord Nelson-street. On Monday, the 19th, Prof. Rankine will lecture in the Philharmonic Hall; on Tuesday, the 20th, there will be a soiree, and on Wednesday a concert in St. George's Hall; on Thursday, Sept. 22, there will be excursions to various places, in the neighbourhood of Liverpool. The sections will be—(A) mathematics and physics, (B) chymical science, (C) geology, (D) biology, (E) geography and ethnology, (F) economic science and statistics, (G) mechanical science.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*August* 20, 1870.